

## Claims:

We Claim:

1 1. An apparatus for blind joint channel estimation and signal detection in a  
2 communication system including a plurality of channels for transmitting symbols,  
3 comprising:

4 means for estimating the plurality of channels using symbols received from  
5 the plurality of channels;

6 means for selecting a best channel from the estimated plurality of channels;

7 and

8 means for detecting symbols received only on the best channel while  
9 updating only the best channel.

1 2. The apparatus of claim 1 wherein the means for estimating the plurality of  
2 channels further comprises:

3 a first symbol detector;

4 a trellis-based multiple-channel estimator connected to the first symbol  
5 detector;

6 a status monitor connected to outputs of the first symbol detector and the  
7 trellis-based multiple-channel estimator; and

8 a best channel selector connected to an output of the status monitor.

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1 3. The apparatus of claim 1 wherein the means for detecting symbols further  
2 comprises:  
3 a second symbol detector;  
4 a trellis-based best channel updater connected to the second symbol detector  
5 via a deal;  
6 a minimum path metric determiner connected to an output of the second  
7 symbol detector; and  
8 a multiple channel selector connected to an output of the minimum path  
9 metric determiner.

1 4. The apparatus of claim 1 wherein the means for estimating the plurality of  
2 channels includes a best channel selector connected to an output of a status  
3 monitor, and the means for detecting includes a multiple channel selector  
4 connected to an output of a minimum path metric determiner, and further  
5 comprising:  
6 a switch connected to the best channel selector connected and the multiple  
7 channel selector, the switch configured to connect an input signal including the  
8 symbols to the means for estimating the plurality of channels and the means for  
9 detecting symbols received only on the best channel.

1 5. The apparatus of claim 4 further comprising:  
2 a buffer for storing the symbols before the symbols are processed by the  
3 means for detecting symbols received only on the best channel.

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6. The apparatus of claim 1 wherein the means for estimating the plurality of channels and the means for selecting the best channel determine the best channel based on minimum path metrics and channel variations measured in a Viterbi trellis with updating the plurality of estimated channels according to estimated symbols.

7. The apparatus of claim 4 wherein the means for detecting symbols detects symbols received through the best channel and determines when to switch the input signal to the means for estimating the plurality of channels based on minimum path metric of a Viterbi trellis using maximum likelihood techniques applied to the best channel.

8. The apparatus of claim 1 wherein the means for estimating the plurality of channels uses parallel list Viterbi algorithm to concurrently maintain multiple estimate of the plurality of channels and the best channel is selected has a minimum path metric and correct evolution.

9. The apparatus of claim 8 wherein the multiple estimates are updated using a least mean square process.

10. The apparatus of claim 8 wherein the multiple estimates are updated using a recursive least square process.

11. The apparatus of claim 1 wherein the received symbols are mapped to a Viterbi trellis according to a linear constraint expressed by:

$$N_{trellis} = 2^L(2^{L+1}-2)(2^{L+1}-4)\dots(2^{L+1}-2L), \quad (6)$$

where  $N_{trellis}$  is the number of mappings, the number of terms is  $L+1$ , and the received channel symbols are

$$\{c_1, c_2, \dots, c_2^L, -c_2^L, \dots, -c_2, -c_1\}.$$

12. The apparatus of claim 11 wherein the best channel is selected before less than fifty symbols are received when  $L$  is less than four.

13. The apparatus of claim 1 wherein the symbols are detected while the best channel is updated in only one pass of a Viterbi trellis.

14. The apparatus of claim 1 wherein the best channel updating is delayed after detecting the symbols on the best channel.

15. The apparatus of claim 14 wherein the delay is a less than ten symbols to reduce isolated high value noise that can diverge the updating of the best channel.

- 1 16. A method for blind joint channel estimation and signal detection in a
- 2 communication system including a plurality of channels for transmitting symbols,
- 3 comprising:
- 4     estimating the plurality of channels using symbols received from the
- 5 plurality of channels;
- 6     selecting a best channel from the estimated plurality of channels; and
- 7     detecting symbols received only on the best channel while updating the best
- 8 channel in a single pass.

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